

# Mandalika Transportation Scheduling and Monitoring Information Visualization Based On Website

Wisnu Rizaldy\*, Nadiyah Agitha, Budi Irmawati

Dept Informatics Engineering, Mataram University  
Jl. Majapahit 62, Mataram, Lombok NTB, INDONESIA

Email: [benuwisnu13@gmail.com](mailto:benuwisnu13@gmail.com), [nadiya@unram.ac.id](mailto:nadiya@unram.ac.id), [budi-i@unram.ac.id](mailto:budi-i@unram.ac.id)

**Abstract** The application for KEK (Special Economic Zone) Mandalika as a special economic zone was submitted directly by the Indonesian Tourism Development Corporation (ITDC) in 2014 and stipulated through PP No. 52 of 2014 on June 30 2014. The development of the Mandalika KEK is a follow-up project of ITDC in making Mandalika the next world-class tourist destination. Mandalika is one of the tourist destinations that is currently on the rise, due to the implementation of the 2022 Moto Grand Prix ( Moto GP ) event in March 2022. The large number of domestic and foreign tourists who witnessed the race event caused the number of vehicles passing by to be unorganized. The overflow of vehicles going to Mandalika during the event resulted in long traffic jams caused by public and private vehicles entering the area. The Department of Transportation tries to overcome this congestion by providing buses that can be accessed by the general public. Therefore, the author took the initiative to create an information visualization on website -based vehicle or transportation scheduling that contains statistical information which includes; 1) vehicle statistics , view diagrams of the number of vehicles (cars, motorcycles, buses and other vehicles, 2) schedule statistics, view schedules of various events in Mandalika, 3) tour bus statistics, view bus license plates and number of passengers from various departure points. The author also creates a parking system that can later be used by the organizers so that private vehicles are parked neatly and in a more organized manner. It is hoped that with this application, users can reduce traffic jams in the KEK Mandalika area and save time and assist the Department of Transportation in managing traffic.

**Key words:** Information Visualization, Scrum Method, Mandalika, Transportation, Bus.

## I. INTRODUCTION

The application for KEK (Special Economic Zone) Mandalika as a special economic zone was submitted directly by the Indonesian Tourism Development Corporation (ITDC) in 2014 and stipulated through PP No. 52 of 2014 on 30 June 2014. ITDC itself is a state-owned company that is known for developing and operating world-class tourism complexes such as Nusa Dua in Bali. The development of the Mandalika SEZ is a follow-up project for ITDC in making Mandalika the next world-class tourist destination. [1]

Mandalika is one of the tourist destinations that is currently on the rise, due to the implementation of the 2022 Moto Grand Prix ( Moto GP ) event in March 2022. The large number of domestic and foreign tourists who witnessed the race event made the number of vehicles passing by not well organized . The overflow of vehicles going to Mandalika during the event resulted in long traffic jams caused by public and private vehicles entering the area. The Department of Transportation tries to overcome this congestion by providing buses that can be accessed by the general public.

The author uses the Scrum method, which is a framework from the Agile method that focuses on product development that is complex and can change according to customer needs . Prospective users or customers are also involved while the project is running to provide feedback or this is commonly referred to as interactive , because the author can perform usability testing while the project is running and make adjustments to the application. Scrum makes it possible to tackle complex challenges through product development by increasing collaboration, creativity and productivity. [2]

Based on the results of interviews conducted with informants from the Department of Transportation, it was found that when in the field, there was miscommunication between public transportation and private transportation . The transportation control system carried out by the resource persons, namely using a headway traffic management technique . Each transportation has a queue time or time interval of 15 minutes and an arrival time of around 45 minutes. The application of the headway is used so that transportation continues to run smoothly and free of obstacles.

Therefore, the author took the initiative to create an information visualization on website -based vehicle or transportation scheduling that contains statistical information which includes; 1) vehicle statistics , view diagrams of the number of vehicles (cars, motorcycles, buses and other vehicles, 2) schedule statistics, view schedules of various events in Mandalika, 3) tour bus statistics, view bus license plates and number of passengers from various departure points. The author also creates a parking system that can later be used by the

organizers so that private vehicles are parked neatly and in a more organized manner . It is hoped that with this application, users can reduce traffic jams in the KEK Mandalika area and save time and assist the Department of Transportation in managing traffic.

II. STUDY LITERATURE

A research conducted by students at Muria Kudus University, namely making a visualization of the embroidery industry in Kudus Regency. This research was conducted to support the Kudus government's program in data collection and development of the embroidery industry. The application used utilizes the geographic mapping feature or commonly called (Geographical Information System) and through the bearing and distance points starting from the zero point, namely the town square of Kudus. The results show that only two tables are used for data storage, namely the user table and the embroidery industry table. [3] The author also uses the GIS feature to visualize information in the area around Mandalika as well as several tables, such as the Community, Admin, TS Officer , Schedule , and Bus tables.

Through the application of GPS Tracker technology to identify traffic conditions on the roads around Kuta, students from Udayana University managed to visualize it into an OpenGTS application, which is an open-source application that comes bundled with a GPS server called Traccar. The test results show that the system built is able to correctly map speed and position data information into traffic traffic information categories. Delivery delays that occur are caused by the condition of the GSM network used in data retrieval. [4] The author also plans to implement or visualize the presence of buses on roads around Mandalika and utilize an internet connection to obtain real-time visuals .

The research conducted by three students from the Malang Institute of Technology, namely City Spatial Visualization using a case study in Lowokwaru District, obtained quite significant results. CarryMap (their application name) can display information in the form of zone, subzone, classification, source, area, coordinates, street name, classification information. The results show that the data can be accessed and updated in real-time using a mobile device that supports GPS access. To add details of specific land uses for information, complete with photos of each zone. [5] The author also displays information in the form of date & time, bus status, coordinates, and description. The devices used are smartphones and laptops because the displays provided support both responsive and web modes.

The case study in India uses GPS and GSM technology visualization. GPS is one of the technologies used in a large number of applications today. One of its applications is to track the vehicle and keep monitoring it periodically. This tracking system can tell the location and route taken by the vehicle, and this information can be observed even from remote locations. The main goal is to design a system that can be easily installed and provide a platform in the

form of a website from the client side for further improvement. The results show that vehicles are safer by using GPS, GPS technology, and web applications. As well as being safe, the role of parents to look after their children is better than before, being able to track animals in the forest, implementing more efficient delivery services, and being used in police departments and fire services. [6] Visualization of GPS technology is also used in applications that are made, namely for the need to place checkpoints for each bus on the map.

Researchers in China created a tourism information system that is used by travelers or tourists to obtain references in the form of tourist destination information for their trips using the Google Maps API and GIS. The reason is because it is very difficult to find tourist attractions with accurate routes and most of them rely more on self-navigation . The results showed that the combination of GIS web technology with Google Maps can be implemented properly so that it effectively solves the lack of information retrieval on websites which is still relatively minimal. This is characterized by a special classification, namely tourism information and other supporting factors. From this, tourist information becomes more accurate and concrete for most tourists. [7] Likewise with the author, visualization of scheduling information is an option offered to users, both tourists and local residents attending the Mandalika MotoGP event .

A retrospective study conducted in Oregon, United States of America, implemented a web-based application using the Google Maps API to obtain and validate models that accurately predict ambulance arrival times. The degree of accuracy is measured by approximating the proportions that are within a 5-minute time interval. The results showed that around 48,308 transports had an actual time of less than 16% of the time interval. The use of siren lights saves an average of 3.1 minutes for transportation that arrives at a place less than 8.8 minutes, and 5.3 minutes for vehicles that exceed that time. [8] The use of time intervals will also be applied by the author, according to the background previously described. 15 minutes is the reference for each vehicle. However, the formulation of this interval calculation was not carried out by the authors, but instead used a policy from the Department of Transportation so that people understood and understood these regulations.

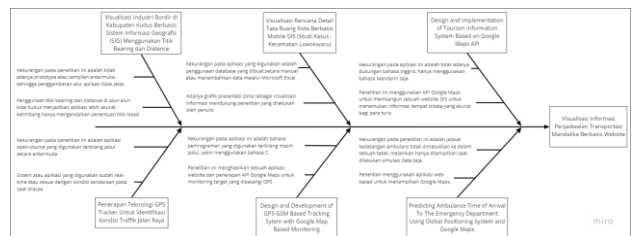


Figure 1. Fishbone Literature Review

Based on the studies presented, a common thread can be drawn as an author's review to create a visualization of website-based scheduling information to visualize the

position of buses or other public vehicles and the Google Maps API as a form of map interface that displays transportation when there is congestion on the Mandalika highway . In addition, the scheduling application is made to flow as minimally as possible and can be understood by users who are still new to this application, of course with a friendly and easy-to-understand interface.

### III. METHOD

#### A. Implementation Plan

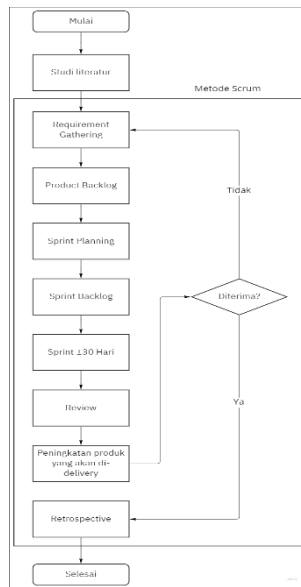


Figure 1. Flowchart Scrum

Scrum is a software development model that is widely used both on an industrial and educational scale. There are several stages in using the Scrum method, including: Requirement Gathering, Product Backlog, Sprint Backlog, Sprint, Development , and Product Delivery .

#### 1. Requirements Gathering

The author collects user needs which include supporting needs to carry out visualization of scheduling information and needs to fulfill business processes.

#### 2. Product Backlog

The author groups user needs that have been generated from the needs gathering process, or can be referred to as backlog items which consist of a list of features and products that must be completed sequentially according to the priority scale ( severity ).

#### 3. Sprint Backlogs

The author carries out the work on fulfilling the needs according to the known backlog items based on the product backlog or the needs analysis phase.

#### 4. Sprints

The author gives an explanation to the Product Owner regarding the description of how visualization of scheduling information will be made using product prototype media. In addition to explaining the visualization of scheduling information, the author also provides advice regarding technical matters, such as the need for internet networks, servers, hosting, domains , HR who will manage

the system in the future, as well as matters directly related to application usage.

#### 5. Development

The author then carries out the coding or program development stage. The development process is carried out according to the results of the sprint until a predetermined time.

#### 6. Product Delivery

After doing development , the author does product delivery to the Product Owner to be tested first. If something really needs to be changed or maintained , then the list is included in the product backlog and will continue to cycle until the project is declared closed . [14]

scrum method in this research is because this method has several advantages compared to other methods such as helping to save time, this method can be run in a matter of days, besides that this method can respond to a change quickly this helps the author in solving problems related to the system created. . With the advantages possessed by the Scrum method it fits perfectly with the design made. [15].

#### B. System Requirements Analysis

In The following are the tools used to visualize transportation scheduling information in Mandalika, including:

1. Laptop Acer Aspire E14 E5-475G-52D8 Intel Core i5 7200U 2.5 GHz
2. Windows 10 Pro Operating System
3. Visual Studio Code
4. XAMPP
5. MySQL.

#### C. System Architecture Design

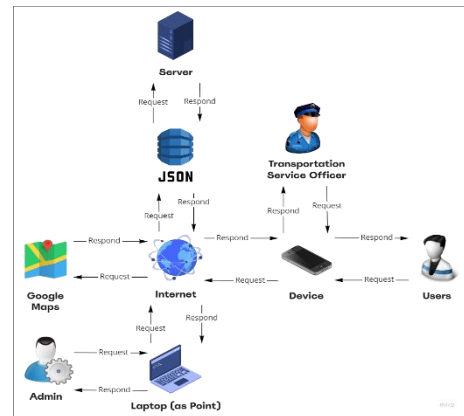


Figure 3. System architecture

In Figure 3., it is illustrated as a system architecture, where the image shows the flow or pattern of how the system interacts with one another. Users or users will request data in the form of visualization of scheduling information via a device ( laptop or smartphone ) connected to an internet connection to access features connected to Google Maps. Meanwhile, the Admin and Transportation Service Officers ( Transportation Service Officers ) play a role in providing and adding information to the system created with Telegram bots as monitoring media.

#### D. Use Case Diagram

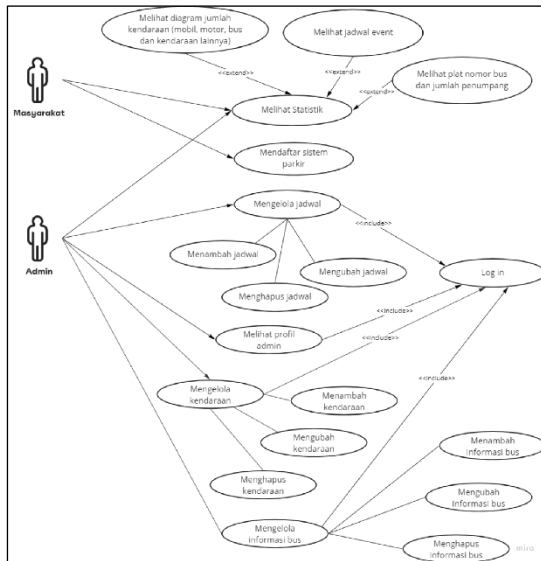


Figure 4. Use Case Diagram

In Figure 4., a use case diagram is illustrated that refers to the system, namely several activities that can be carried out by the Community as users, including: viewing statistics, while statistics that can be seen include 1) viewing a diagram of the number of vehicles, such as cars, motorcycles, buses and other vehicles. 2) see the event schedule. 3). Look at the bus number plate and the number of passengers. Users can also register for the parking system through the landing page provided. While the activities carried out by the Admin are all activities on the system both on the user side ( front-end ) and on the back-end side , because the Admin gets more privileges to see all views or pages. So all activities carried out by the user can also be carried out by the Admin. Here are some things that can be done by the admin on the back-end including: 1) can manage schedules (add, change, and delete schedules). 2) manage vehicles (add, change and delete vehicles). 3) managing bus information (adding, changing, and deleting buses) and 4) viewing admin profiles. The community as a user does not need to log into the system, because the community can immediately see a list of schedules on the landing page . But unlike the Admin, he needs to log in to enter the dashboard page so he can manage the features in it.

#### IV. RESULTS AND DISCUSSION

After building the wireframe, of course there are some suggestions that are obtained after being tested by the examining lecturer and also given directions by the examining lecturer. Several revisions have been made in order to get an initial picture in accordance with the previous agreement.

In addition, the author also communicates directly with related partners, namely the Department of Transportation for synchronization of the initial concept. Then, the author demonstrates the application that has been made before. With the pre-adjusted interface and the features described

by the author, here is an explanation of each feature in the application:

#### A. Requirement Gatherings

There are several features that have been confirmed by the Department of Transportation and automatically change the flow of making wireframes before. There are several features that were finally agreed upon, including:

##### 1. Schedules Information (Event Schedule & Bus Pickup in Mandalika)

This feature can later provide information via the website, be it the name of the event, the date and time the event was held, and the location point in the form of a link that leads to the Google Maps application so that users can go directly to the event. In addition, there is also bus information that picks up according to the parking ticket details that have been previously registered.

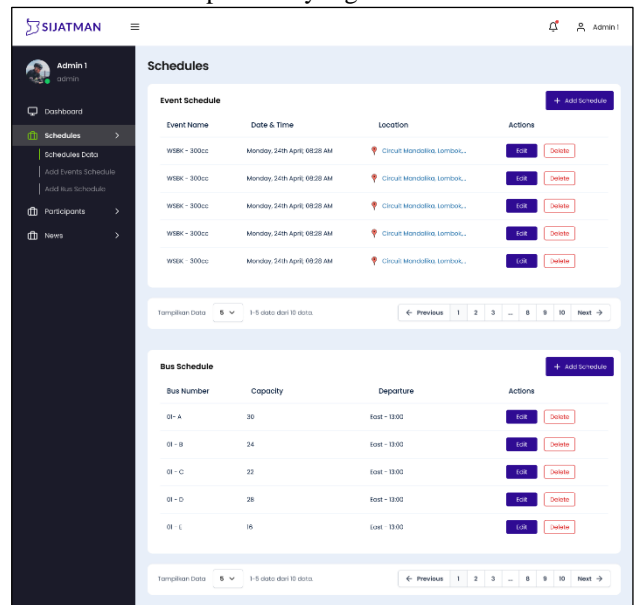


Figure 5. Schedule UI View

##### 2. Participant Information

This feature provides information on community data or participants who use the parking system feature on the SIJATMAN website. In addition, an accumulation of participants who use vehicles or use modes of transportation provided by the Department of Transportation will collect and display, including Two-Wheeled Vehicles (Motorcycles), Four-Wheeled Vehicles (Cars, Buses or Trucks), and Other Vehicles

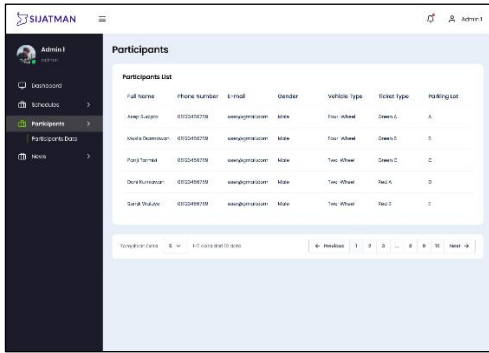


Figure 6. Participants UI View

### 3. Information News

The latest news feature about Mandalika and events that will be held later. Users can read the latest articles and get important information in them.

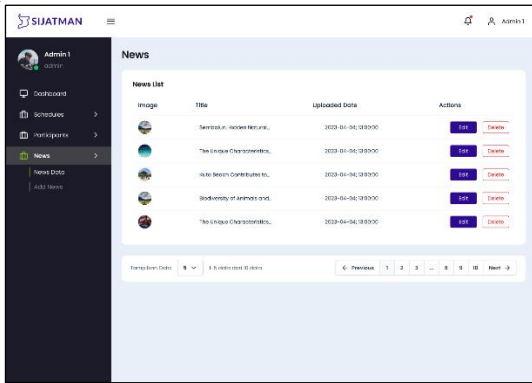


Figure 7. News UI View

### 4. Parking Tickets

A parking ticket system that makes it easy for users to register their vehicle to park at Mandalika. Only by inputting the form and showing proof of registration, users can already book a parking spot from the day before the event takes place.

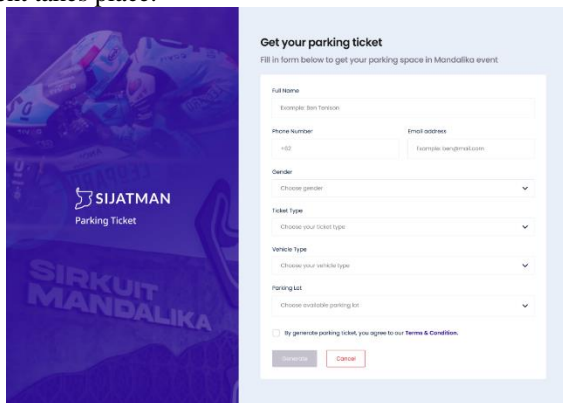


Figure 8. Form Get Parking Ticket UI View

## B. Application Creation and Development

After confirming and re-checking the application requirements, the next step is to make the SIJATMAN application. Starting with building a database, application sitemap, application architecture, landing page, to the CMS

Dashboard. This is done periodically according to the stages of application development.

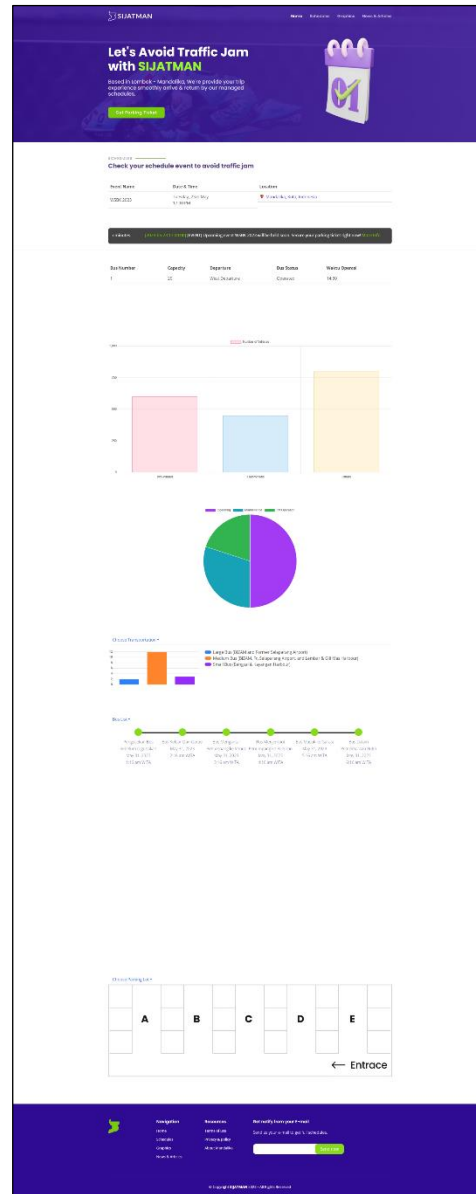


Figure 9. SIJATMAN Landing Page

## C. Application Testing

At the application testing stage, the author uses a method with a user and admin approach where the respondent or tester is one of the event participants and the admin from the Department of Transportation, namely using the User Acceptance Testing (UAT) method. This method is carried out by testing each feature that has been implemented in the SIJATMAN application. This aims to find errors (can be in the form of bugs or direct errors), so that after they are found and corrected they can improve the user experience and the application is close to perfect.



Figure 10. Testing of the SIJATMAN Application by the Department of Transportation

### C.1. Test Results of User Acceptance Testing (UAT)

Following are the test results of the SIJATMAN application using the User Acceptance Testing method to test whether the functions in the system are running according to the targets to be achieved.

#### C.1.1 Get Parking Ticket feature

In this parking system feature, there are several stages or flows that have been tested by participants where participants register to get tickets in the form of a QR Code.

Table 4.1 UAT testing on the Get Parking Ticket feature

Test Scenario	Expected results	Test result	Conclusion
Fill out the ticket form and press the generate button	The inputted data is successfully saved to the database table and the QR Code is successfully created	In accordance	Valid

#### C.1.2 Scheduled Events feature

In this event schedule feature, there is a table that contains event schedule data in the form of the event name, date, and event location in the form of a link. In addition, the admin can add a schedule of any events that will be carried out.

Table 4.1 UAT testing on the Schedule Event feature

Test Scenario	Expected results	Test result	Conclusion
View event table data and add new events	The inputted data is successfully saved to the database table and appears in the event data	In accordance	Valid

#### C.1.2 Scheduled Bus feature

In this bus schedule feature, there is a table that contains bus schedule data for pick-up at the parking terminal in the form of bus number, capacity, and bus departure. In addition, admins can add bus pick-up

schedules and manage the amount of bus capacity provided.

Table 4.1 UAT testing on the Schedule Bus feature

Test Scenario	Expected results	Test result	Conclusion
View bus table data and add new events	The inputted data is successfully saved to the database table and appears on the data bus	In accordance	Valid

#### C.1.2 Participants feature

In this participant feature, there is a table containing the data of all participants who have used the parking ticket system. Starting from full name, telephone number, email, ticket type, and parking area.

Table 4.1 UAT testing on the Participants feature

Test Scenario	Expected results	Test result	Conclusion
View the participants table data	Participant data that has used the parking system can be seen in the participants data menu	In accordance	Valid

#### C.1.2 News and Articles feature

In this news and article feature, there is a table containing news data which can later be seen on the SIJATMAN landing page. Starting from the news title, news date, author, to the contents of the news content. In addition, the admin can add the latest news using the add news feature.

Table 4.1 UAT testing on the News & Articles feature

Test Scenario	Expected results	Test result	Conclusion
View news & articles table data and add the latest news	The inputted data is successfully saved to the database table and appears in the news & articles data	In accordance	Valid

### C.2 Test Results of System Usability Scale (SUS)

Apart from using the UAT testing method, the authors also use other testing methods in order to get more accurate results and adapt them to the perspective of the people who will use the SIJATMAN application. Here are the test details.

#### C.2.1 Questionnaire Questions

The SUS method uses a Likert scale, which is an assessment from a scale of 1 to 5, where scale 1 is strongly disagree, scale 2 disagrees, 3 is neutral, 4 agrees, and scale

5 strongly agrees. The following are the questions used in the method.

1. I think I will often using this feature.
2. I feel this feature is too complicated where we can made more simple.
3. I think this feature is easy for use.
4. I think I need help from a technical person to use this feature.
5. I found that there is various type integrated feature with good system.
6. I think there's a lot thing that isn't consistent found in this feature.
7. I think the majority user can learn this feature fast.
8. I found that this feature is not so practical when used.
9. I'm absolutely sure can use this feature.
10. I've to study lots matter especially formerly before I can use this feature.

### C.2.2 Test Score

The questionnaire was created using Google form , then, the survey results that have been collected, are calculated using the SUS method with the following conditions:

- a. For each question in odd order, subtract one. Example question 1 has a score of 4. Then subtract 4 from 1 so that the score of question 1 is 3.
- b. For each question in even order subtract the score from five. Example question 2 has a score of 1. Then subtract 5 from 1 so that the score of question 2 is 4.
- c. Add up the values of the even and odd numbered statements. Then the sum is multiplied by 2.5.

The following are the calculation results obtained from the questionnaire survey:

Table 6. UAT testing on the News & Articles feature

	Odds	Even
<b>Take Result</b>	16	12

<b>SUS Score</b>	70
------------------	----

A SUS score of 70 was obtained. Referring to the standard value applied to Figure 4.27, the application can be said to be suitable for use and the level of user satisfaction can be said to be good.

SUS Score	Grade	Adjective Rating
> 80.3	A	Excellent
68 – 80.3	B	Good
68	C	Okay
51 – 68	D	Poor
< 51	F	Awful

Figure 11. SUS Score Standardization

## V. CONCLUSIONS AND SUGGESTIONS

### A. Conclusions

Based on the description and discussion that has been described previously, the following are some conclusions that can be drawn:

1. The design of the Mandalika Transportation Scheduling and Monitoring Information Visualization application (SIJATMAN) in this final project can provide a solution and can be an alternative to reduce the impact of congestion and be able to manage various types of transportation. In addition, it will be easier for the public to get information on event schedules and bus pick-up schedules so that traffic conditions around Mandalika can be arranged neatly and efficiently.
2. Some of the features supported in this application include: The Get Parking Ticket feature which can make it easier for participants or the public to park in the space provided, Various features on the admin dashboard, such as the feature for adding event and bus schedules, the participant data management feature, and the feature add news and articles. With this feature, the community and the Transportation Agency admin can collaborate to be more effective in regulating transportation flow patterns in Mandalika.
3. The research that has been done and the making of the application has received a positive response from the

users and admin of the Transportation Agency, marked by the test results using the User Acceptance Testing (UAT) method which are as expected and of course there are several additional minor features to complete the information on the landing page and dashboard.

### B. Suggestion

There are also suggestions that later future research can perfect the author's research and can be implemented even better in accordance with the development of events in Mandalika, namely as follows:

1. This system When the next stage of development or a newer version is carried out, this application is expected to be used in all events that are in areas other

than Mandalika, for example tourism areas or other national / international performance events.

2. The system was built using a UI/UX approach, namely creating lo-fi wireframes and hi-fi wireframes to improve information visualization and facilitate the delivery of information to participants and admins.
3. The SIJATMAN application can be used as a reference for conducting further research or creating a new product with improvements to facilitate the delivery of transportation information and other things that are considered important.

### REFERENCES

- [1] H. Nala Estriani , " Special Economic Zone ( SEZ ) Mandalika in the Implementation of Ecotourism - Based Tourism Concepts : Opportunities and Challenges , " vol . 2, no. 1, 2019.
- [2] K. Bhavsar, V. Shah, and S. Gopalan, " *Scrum : An Agile Process Reengineering In Software Engineering* ," no. 3, pp. 840–848, 2020 .
- [3] A. Imario, " Visualization of the Embroidery Industry in Kudus Regency Based on Geographic Information Systems (SIG ) Using *Bearing Points and Distance* ," 2017 .
- [4] IO Widyantara, IGAK Warmayana, and L. Linawati, "Application of GPS Tracker Technology for Identification of Highway Traffic Conditions," *Maj. Science. Technol. Electro* , vol. 14, no. 1, 2015 .
- [5] M. Silvester Jasmani, "Visualisasi Rencana Detail Tata Ruang Kota Berbasis Mobile GIS (Studi Kasus : Kecamatan Lowokwaru)," (*Doctoral Diss. ITN malang*), pp. 1–7, 2018.
- [6] P. Verma and J. . Bhatia, "Design and Development of GPS-GSM Based Tracking System with Google Map Based Monitoring," *Int. J. Comput. Sci. Eng. Appl.*, vol. 3, no. 3, pp. 33–40, 2013.
- [7] Y. Wu, Z. Liang, and L. Liu, "Design and implementation of tourism information system based on Google Maps API," in *2013 21st International Conference on Geoinformatics*, 2013.
- [8] RJ Fleischman, M. Lundquist, J. Jui, CD Newgard, and C. Warden, "Predicting Ambulance Time of Arrival to the Emergency Department Using Global Positioning System and Google Maps," *Prehospital Emerg . Care* , vol. 17, no. 4, pp. 458–465, 2013 .
- [9] A. Hafid, " The Effectiveness of Using Compact Disc Video-Based Learning Visualization to Improve Student Learning Outcomes in TIK Subject Computer Hardware Material Class V II SMPN 1 Kartasura," p. 45, 2013 .
- [10] G. Prakoso, "Analysis and Implementation of the Integrated Taxonomy Framework in Information Visualization," no. 113081009, 2012.
- [11] M. Destiningrum and QJ Adrian, " A Web-Based Physician Scheduling Information System Using the CodeIgniter Framework (Case Study: Yukum Medical Center Hospital)," vol. 11, no. 2, pp. 30–37, 2017.
- [12] S. Yuvaraj, "Smart Supply Chain Management using Internet of Things ( IoT ) and Low power Wireless Communication Systems," pp. 555–558, 2016.
- [13] J. Fitzgerald and T. Oda, " *Proceedings of the 18th* ," 2021.
- [14] U. Ependi, "Implementation of the Scrum Model in the Palembang Tourism Polytechnic Student Entrance Selection Information System," vol. 3, no. 1, pp. 49–55, 2018.
- [15] Rusmalina, Yufia, L. Andrawina, and H . Dwi Anggana. "Design of a Management Information System for Services in the Mandalajati District Using the Scrum Method" 2021.